CLAIMS

1. A pattern identification method for hierarchically extracting features of input data, and identifying a pattern of the input data, characterized by comprising:

a first feature extraction step of extracting features of a first layer;

a determination step of determining a method of extracting features of a second layer higher than the first layer on the basis of feature extraction results in the first feature extraction step; and

a second feature extraction step of extracting features of the second layer on the basis of the method determined in the determination step.

2. The method according to claim 1, characterized in that the determination step includes a step of analyzing a distribution of feature extraction results in the first feature extraction step, and determining the method based on the analyzed distribution.

3. The method according to claim 2, characterized in that the determination step includes a step of calculating likelihood values of a plurality of features of the second layer on the basis of the distribution, and determining features which have the calculated likelihood values not less than a predetermined value as objects to be extracted.

4. The method according to claim 1, characterized in that the first or second feature extraction step includes a step of extracting features obtained by applying predetermined conversions to a predetermined feature.

5. The method according to claim 1, characterized by further comprising a re-extraction step of re-extracting features of a lower layer on the basis of the feature extraction results of an upper layer in the second feature extraction step.

6. The method according to claim 1, characterized in that the determination step includes a step of analyzing distributions of the plurality of feature extraction results, and analyzing a relative relationship among the individual analysis results.

7. The method according to claim 1, characterized in that the determination step includes a step of analyzing a distribution of at least one feature extraction result within a specific range.

8. The method according to claim 1, characterized in that the determination step includes a step of analyzing if the feature is extracted or not extracted within a predetermined range in a distribution of at least one feature extraction result.

9. The method according to claim 1, characterized in that the determination step includes a

step of analyzing a barycentric position of a distribution of at least one feature extraction result.

10. The method according to claim 1, characterized in that the determination step includes a step of analyzing a size of a range from which the feature is extracted or not extracted in a distribution of at least one feature extraction result.

11. The method according to claim 1, characterized in that the determination step includes a step of analyzing a sum total of likelihood values or feature detection levels of at least one feature extraction result.

12. The method according to claim 1, characterized in that the second feature extraction step includes a step of extracting features by setting a model, and

the determination step includes a step of determining a model to be set in the second feature extraction step.

13. The method according to claim 12, characterized in that the first feature extraction step includes a step of extracting features by setting models, and a model used in the second feature extraction step is formed by combining predetermined models used in the first feature extraction step,

the first detection step includes a step of calculating feature amounts of the models with respect

to forming parts of the pattern by comparing the models used in the first detection step and the forming parts of the pattern, and

the determination step includes a step of determining a specific model to be a model to be set on the basis of feature amounts of models which form the specific model.

14. The method according to claim 13, characterized in that the determination step includes a step of determining, when all the models which form the specific model have a predetermined feature amount, the specific model as the model to be set.

15. The method according to claim 12, characterized in that the determination step includes a step of determining a plurality of models which are formed by rotating an identical model at a plurality of angles as models set to be set.

16. The method according to claim 12, characterized in that the determination step includes a step of limiting the number of models to be set on the basis of feature amounts calculated for the models.

17. The method according to claim 15, characterized in that the determination step includes a step of selecting rotation angles of low-order models having feature amounts not less than a predetermined amount of the calculated feature amounts of the low-order models, and determining high-order models

corresponding to the selected rotation angles as the models to be set.

18. The method according to claim 15, characterized in that rotation angles of low-order models, which have higher order in the order of feature amounts, of the calculated feature amounts of low-order models, are selected, and high-order models corresponding to the selected rotation angles are set.

19. The method according to claim 16, characterized in that the rotation angles of low-order models are measured on the basis of the calculated feature amounts of the low-order models, and the number of high-order models is limited using the measured rotation angles.

20. The method according to claim 15, characterized by further comprising a change step of changing a rotation interval of a plurality of angles upon setting a plurality of models rotated at the plurality of angles, and

in that the change step includes a step of decreasing the rotation interval of models in a higher-order layer.

21. The method according to claim 13, characterized in that a predetermined reference model is held, and

the determination step includes a step of determining a model obtained by converting the

reference model using the calculated feature amount as a model to be set.

22. The method according to claim 1, characterized in that predetermined reference data is held, and

the determination step includes a step of determining data used in the second feature extraction step on the basis of the reference data and feature extraction results in the first feature extraction step.

23. The method according to claim 22, characterized in that the determination step includes a step of determining data to be used at each spatial position of an input signal.

24. The method according to claim 22, characterized in that the reference data is data used to detect a plurality of features which form a typical pattern of the predetermined pattern,

the determination step includes a step of converting the held reference data on the basis of a positional relationship between the plurality of features extracted in the first feature extraction step, and

the second feature extraction step includes a step of determining a presence/absence of the predetermined pattern included in the input signal on the basis of correlation between the converted reference data and the input signal.

25. A pattern identification method characterized in that the determination step includes a step of determining a size of an input range from a detection result of a previous layer used in feature detection in the first feature extraction step on the basis of the feature extraction results in the first feature extraction step.

26. The method according to claim 25, characterized in that determination step includes a step of determining a size of the input range for each spatial position of an input signal.

27. The method according to claim 1, characterized by further comprising:

a result holding step of holding the feature extraction results in the first feature extraction step;

a parameter acquisition step of obtaining a parameter on the basis of the detection results held in the result holding step; and

a change step of changing the feature detection results to be read out in the second feature extraction step on the basis of the parameter obtained in the parameter acquisition step.

28. The method according to claim 1, characterized in that the input data is an image, and each of the first and second feature extraction steps

includes a step of extracting features which form a face.

29. A pattern identification device for hierarchically extracting features of input data, and identifying a pattern of the input data, characterized by comprising:

first feature extraction means for extracting features of a first layer;

determination means for determining a method of extracting features of a second layer higher than the first layer on the basis of feature extraction results in the first feature extraction step; and

second feature extraction means for extracting features of the second layer on the basis of the method determined by said determination means.

30. The device according to claim 29, characterized by further comprising image sensing means for sensing and inputting an image as the input data.

31. A computer-readable pattern identification program, which makes a computer hierarchically extract features of input data, and identify a pattern of the input data, said program makes the computer execute:

a first feature extraction sequence for extracting features of a first layer;

a determination sequence for determining a method of extracting features of a second layer higher than

the first layer on the basis of feature extraction results in the first feature extraction sequence; and

a second feature extraction sequence for extracting features of the second layer on the basis of the method determined in the determination sequence.